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Lumber from best logs kept together, piled and seasoned as above to aid in matching grain for fancy furniture, cabinet work, etc.

Impressions of German Utilization

NELSON C. BROWN

Assistant Prof. of Forest Utilization, New York State College of Forestry

To an American forester, accustomed to our extensive practice of forestry and our rough methods of utilization, the closeness with which the Europeans utilize the products of the forest is truly a revelation.

It has been estimated that in the past only about 40 per cent of the trees actually felled by the axe in our American forests are ultimately used in one form or another. The remaining 60 per cent is waste in the form of stumps, tops, branches and defective logs left in the woods, and in the form of slabs, edgings, saw dust, and other mill waste so common in all of our large saw mills. Obviously, a large part of this waste is unavoidable; it does not pay to put it on the market. Contrasted to these figures, it is estimated that, in Germany, they utilize from 94 to 96 per cent of not only the trees that are felled, but of all the wood that is grown in the forests.

The initial impression given in a visit to Germany to study their forest practice is that their forest management is so much more in advance of our own. Forestry is everywhere and is always under an intensive scheme of management. In this country we go out to our National Forests in the west or to certain forest regions, such as the Adirondacks, Lake States, Southern Appalachians or Southern Pineries to show what is or can be done in the way of real forestry. In Germany forestry can be seen practically everywhere, and is not limited or confined to such regions as the Black Forest, the Thuringian Mountains or the Saxon up-lands. The line of demarcation between agricultural and forest soils is drawn very closely in Germany, and every bit of land is put to its highest economic and productive use. There is no so-called waste land, of which we have so much in this country. Some of the oldest settled States here contain between 10 and 35 per cent of these waste

lands, many of which are often included within farms and are absolutely unproductive in their present condition.

Even on the barren, sandy plains of Prussia they are making excellent profits by planting Scotch pine and nurturing it with an under-story of beech. In the last decade, the average annual cut per acre in Prussia was over 600 feet, board measure. One can hardly travel a mile without seeing beautifully kept forests, usually in straight planted rows. There is no burned or dead standing timber which is so common in all of our forest regions. Whenever an insect attack breaks out, every precaution is taken to check it and prevent further spread or damage. Whenever a fire starts from any cause, it is considered a matter of public concern to put the fire out, and in some places the town bell is rung and everyone rushes out to fight the fire.

The second impression is the comparatively small number of species that enter into German forestry practice as compared with the great unmber of available and suitable native species in this country. Practically their whole system of forestry depends upon four or five species, such as Scotch pine, Norway spruce, European beech, Silver fir, and oak. To be sure, there are a great number of others, such as larch, ash, willow, alder, etc., but they are unimportant as compared with the principal ones. Contrasted with this suitation, there are at least 40 or 50 species that will be available and valuable for future management in this country. Some of our best American trees, such as white pine, Douglas fir, and red oak, have already been introduced into Germany and used with considerable success. Redwood, white ash, black locust, yellow poplar and western yellow pine are also being used.

The last and perhaps the best impression gained in studying German forestry is the closeness with which they utilize the products of the forest. The study of this very important phase of forestry was especially interesting; and opportunities to observe typical examples of extensive utilization were not confined to a few places scattered here and there, but could be found in almost every part of Germany.

This close utilization is made possible by the following conditions:

1. Comparatively high prices obtained for all kinds of for-

est products. It is simply a case of the old economic law of supply and demand. Timber has become so scarce and consequently so valuable that it commands very attractive prices, and, in fact, is still rising so rapidly that wherever a substitute can be introduced to advantage it has been used. In this respect we are now passing through the same economic evolution in our national development that Germany passed through probably 200 years ago, and, in all likelihood, we will rapidly approach this condition and solve the problems in the same general way that Germany has done in the utilization of the products of the forest. In visiting practically every region of Germany, the writer did not see a single modern house of any proportions made out of wood. Concrete, brick and stone are used almost entirely for buildings. Even the roofs are covered with tiling. On the other hand, the German railroads have attempted to use iron ties in place of wooden ones, but it has been determined that they will not stand the heavy pressure of traffic and easily corrode in the damp climate, so that they are reverting to the use of creosoted ties entirely.

2. The excellent markets for all knds of wood products. This is obviously closely associated with the above. Germany is one of the most densely populated nations in the world, and there is not a single part of the tree which cannot be utilized to profitable advantage. Although there is not such a great demand for construction and general finishing timbers as in this country, most of their larger wood products go into interior finish, flooring, ties, furniture, cooperage, sash and doors, and a great variety of small materials.

3. Cheap labor. The cost of labor is a very important item in securing close utilization of forest products. Labor is so high in this country that, up to the present time together with the comparatively low prices obtained for wood products, only the best material could be marketed and utilized to advantage. For instance, men in Germany are willing to work for 75 cents to $1 per day in the same character of employment that men in this country would expect from $1.50 to $2.25 per day for.

4. National spirit of economy and conservation. To this fact may be attributed a considerable amount of the closeness with which Germany can utilize the products of her forests. The German is inherently and by training a frugal, careful,

saving individual and bears out a strong contrast to the American spirit of prodigal waste.

Most of the logging operations are small when compared to what we consider an ordinary lumbering operation in this country. Most of the woods work is done by oxen and horses, along with manual labor, and they do not have or use all of the many labor-saving devices that are so common in connection with logging and saw mill practice in this country. Long timbers of tree lengths are very commonly sawed in the woods. They are hauled in this size to the mill which makes permissable economy both in transportation and in the cutting up of the stem at the mill into the desired lengths suited for the market. After the main bole is cut, the smaller branches are gathered together into fagots, the larger branches into fuel wood, and everything is sold at a profit. Even the stumps are grubbed out and sold for fuel. In some cases, stumps are sold to wood distillation plants for the production of charcoal, tar, wood alcohol, acetates, etc. Norway spruce logs are usually barked in the woods, and the bark, after being seasoned in piles, is used for tanning purposes.

In the mill, which is usually one corresponding to a capacity of from 20,000 to 50,000 board feet per day, the gang saw is almost universally in use. They saw "through and through" with a resultant minimum loss in the form of saw dust, slabs, edgings, etc. Wherever any small pieces cannot be utilized for any other purpose they are sold for fuel which commands attractive prices in every part of Germany.

In connection with a great many of the state and municipal forests a permanent saw mill is stationed to manufacture the products of the forest. Some of these mills are very remarkable in the great variety of manufactured products they can turn out. For example, one mill, besides the ordinary type of lumber and timber that is turned out in a saw mill, had special machines for the manufacture of broom handles, wooden ware, furniture stock, cooperage, handles, implements, etc. Saw mills are regarded as permanent manufacturing establishments in contrast to those in this country which are dismantled as soon as a tract is cut over. In Germany there is a sustained annual or periodic yield which only removes the *growth* of the forest,

Even the branches lopped off by natural pruning are gathered together and sold as faggot wood.

Logs graded as to size and quality in the Black Forest. Swelled butts show how stumps are cut in the German Forest.

Norway spruce, managed on a 100-year rotation, in Germany.

A logging railroad, maintained on a permanent basis to haul out all classes of forest products.

so that the sawmill is on a permanent basis and is run the year around or at least a part of each year.

In the same way, all improvements made in the forest to facilitate the transportation of the logs to the mill, such as logging railroads, log chutes, haul roads, splash dams, and other stream improvements, are maintained on a permanent basis. In this way, therefore, the overhead and depreciation charges are not so burdensome. Driving is still commonly practiced in the mountainous regions, and all the facilities along the streams are constructed and maintained in a remarkably thorough and efficient manner.

Wood preservation plays an important part in wood utilization in Germany. In conformity with their national spirit of economy, a common practice is to put all inferior or perishable woods through a preservative treatment whenever they are placed in any way that will expose them to the liability of decay. This holds true especially for ties, bridge timbers, etc.

Contrasted to our two principal tie woods, oak and southern pine, which make up 50 per cent of all the ties used in this country, and are distinguished for their durability, hardness and strength, the principal tie woods in Germany are Scotch pine and beech, which are very inferior in these qualities. These are always treated before being placed in the tracks. It is said that Scotch pine will only last from 7 to 8 years without treatment but 17 years with treatment. Beech, untreated, must be replaced in 5 to 6 years, whereas it will last 20 years when treated. This is based on creosoting by the Ruping process. The treatment with Scotch pine costs 21 cents per tie, but penetration of only the sapwood is secured. With beech, it costs about 48 cents per tie, but there is absolute and complete penetration of both heart and sapwood. Scotch pine may prove to be an important source of future tie material in this country.

From the above mentioned impressions of utilization in "the Fatherland", it is apparent that their whole system of forestry is largely dependent upon the prices they can secure for their products. That is, they can practice intensive methods of silviculture, simply because it pays. To substantiate this statement we find that those states and municipalities that have expended the largest amount of money in growing and maintaining their

forests in the highest productive condition, have received the largest returns as a result of that investment.

The following is a concrete example of the close utilization. On one forest, where Norway spruce was managed on a 100 year rotation under a clear cutting system, all the trees were first "barked", and then were cut into lengths of approximately 23 feet and graded according to size, clearness, straightness and freedom from defects. The larger tops were cut into ties and mine props; the smaller used for paper pulp. Then the stumps were grubbed out, and all the branches and even the twigs were graded according to size and sold for fuel wood. After this there was nothing but the bare earth left. The area was planted the following spring and another compartment was cut over.

Red Pine on the Minnesota National Forest

H. H. Richmond, '12

The silvicultural system in vogue for red pine on the Minnesota National Forest consists of clear cutting and leaving scattered seed trees. The first timber sale was made in 1904. At that time, five per cent of the entire stand was left in the form of scattered seed trees for reproductive purposes. Through careful investigations and practical observations by the forest officers in charge, it was shown conclusively that five per cent did not leave enough trees over the area to restock the same successfully. Accordingly, it was recommended and later became a law that, thereafter, on all timber sale areas on the Minnesota National Forest, ten per cent of the stand should be left for reforestation purposes. In stands that cut from twenty to twenty-five thousand board feet per acre five per cent of the trees left standing would be abundant; but, in stands of the more scattered and open types, the seed trees were decidedly lacking in number and very sparsely sprinkled over the area. Then, too, five per cent did not leave a great amount of protection for the ground cover, or for the trees themselves. Many "blow-downs" can be found throughout the timber sale areas.

The leaving of ten per cent of the stand instead of five has, besides the added advantage of much better protection to the ground and ground cover, a greater advantage in the lessening of the danger from windfall. The wind does not do as much damage because the trees serve much more effectively as protectors toward one another. The force and velocity of the wind to which a single, individual tree is subjected is greatly reduced, and we have fewer "blowdowns" resulting. There is a disadvantage in some cases in having too many trees left. This is only applicable, however, to the heavy stands, where the disadvantage is not too many trees for restocking the area, or for protection of soil and ground cover, or for the

carrying on at some future date a logging operation that will be worth the time and money expended; but where the disadvantage lies with the company carrying on the present logging operation.

Perhaps one of the greatest problems, if not the greatest problem, that the logger contends with is that of labor. It is hard to find men who will do efficient work in the woods, especially sawyers. In the heavy stands, where ninety per cent is removed, the ten per cent, from necessity, must be exposed to the felling process. The result is, that, in spite of severe precautionary measures, many trees are damaged and some of them seriously. They are often lodged in felling, and many are felled in such a way that they scrape down the side of a seed tree, breaking and tearing the limbs from it. The fundamental cause of all this is the large majority of foreign men, uneducated, unreliable and uninterested. They are entirely void of any appreciation of conservation and forestry, and, in consequence, the seed trees receive the burden of inefficient labor.

Fire Hazard

A red pine stand is subject to two kinds of fires, the crown fire and the surface fire. The crown fires occur but seldom and are practically unheard of in this section of the country. The surface fires occur frequently. This has been especially true during the past when they have occurred not only frequently but regularly. Through the system of fire prevention and protection of the United States Forest Service, through the State Forest Service and through the co-operative work of the different corporations, the fire hazard has been reduced to a very great extent. During the calendar year of 1913, only .2 of 1 per cent of the entire forest was burned over.

There is not a stand of red pine, however, that has not been damaged by fire at some previous time. The bark of the tree is thin, seldom reaching 1.5 inches in thickness at the base on the very largest and over mature trees, and trees when younger possess bark that is relatively thinner. Considering the life of a tree in chronological order, we may say that, when in the young seedling stage, a surface fire will in the main destroy all that comes in its path. At the height of ten inches to twelve

inches a good part, perhaps 50 per cent of the stand, will escape without being seriously damaged. As the trees grow from then on, they are soldom killed outright, unless it is in the case of a very hard fire. Nevertheless, they are damaged at the base to such an extent that the bark and even the wood itself is burned away, forming a deep fire scar. The scars, aside from the damage they themselves do, play another important part. They pave the way for the development of fungi. They reduce the health, vigor and resisting power of the tree to such an extent that the fungi are offered a ready avenue of admittance. Ninety-five per cent of all the mature red pine trees are fire scarred, and seventy-five per cent of the decay caused by fungi can be attributed to fire and fire scars.

Reproductive Capacity

Red pine is not a prolific seed producer. It has a good yield of seed every four to six years, and every year a small amount can be found. The seed is borne usually on the scrubby, bushy topped trees that grow in the open. It requires two years for the cones to form and mature. They ripen late in the summer, about September first, and open and free the seed in the fall. They are disseminated by several means; namely, birds, squirrels, chipmunks, by water and by the wind. Very little seed, however, is transported by the first four methods, the wind being the big factor in the distribution. The distance to which the wind will transport a seed depends upon the height of the trees and velocity of the wind. This is illustrated wherever a block of trees stands along side of an area of unused, cut-over land. Next to the trees, for a distance of 250 feet, the reproduction is very abundant; at from 250 to 400 feet the reproduction is still quite uniform, but is gradually thinning out; beyond the 400 foot mark it is very irregular and much scattered.

The red pine seed is hard to collect because of its scarcity and because of the method that must be used in gathering it. Nevertheless, the seed itself possesses a good germinating percentage, 85 to 90 per cent, and, given any sort of a chance, it will thrive and grow. Like many others of the pines, it must have mineral soil in which to germinate. After logging operations and burns, where the seed is present, these areas always abound with young seedlings. Old logging grades, excavations,

etc., when found in the immediate vicinity of a block of timber, always, sooner or later, depending on the seed year, become well stocked with reproduction; while right beside such places where the ground is covered with brush, leaves and grass, there is no reproduction. In all cases where the seed is present and has a chance to reach the mineral soil, good results have been obtained. For instance, on the Minnesota National Forest, where clear cutting with scattered seed trees is used and the timber logged during a good seed year or the year following one, results have been excellent. The ground was torn up and the seeds given a chance to get to the soil. In such cases the area has been restocked successfully.

Attainment of Economic Maturity and Normal Duration of Healthy Growth

Economic maturity is attained in red pine at about the age of one hundred and twenty years, according to results that are representative of many stands and age gradations. It takes into account every class of trees from dominant to suppressed. Taking these facts into consideration, and looking at it from a commercial standpoint, I do not think one hundred and twenty years a fair criterion of what can or will be accomplished with annual rate of growth or increment. In making a careful study of twenty sample plots, ranging from 30 to 60 years in age, the facts are forcibly brought out that there are a great many suppressed and dying trees, also a goodly admixture of Jack pine that must be exterminated through years of struggle for supremacy, and that the red pine, after a period of 80 to 100 years, is the survivor. These are of paramount importance in retarding the growth of red pine during its best stage of development. In stands where these factors do not enter in, but are entirely lacking, figures show that, under good silvical management, an average D. B. H. of 8 inches can be obtained at the age of 45 years with a maximum of 12 inches. These figures are representative of existing stands and conditions.

Red pine retains its healthy, vigorous growth until it is 150 years of age. At that time, it begins to decay, loses its resisting powers and becomes more or less susceptible to injuries. At two hundred years of age, it is a mature tree. It is at this time that the crown commences to thin out; and at the age of

two hundred and fifty, a great many of the trees are dying. The average life of a red pine tree is placed at from two hundred and fifty to two hundred and seventy-five years. Investigations show that the oldest individual tree found on the Minnesota National Forest was three hundred and seven years of age.

Marking the Timber.

Usually all mature and over-ripe trees should be cut. They have passed their stage of usefulness and are no longer of any benefit for seeding purposes. Likewise, all trees which show broken tops, punk knots, bad crooks, badly damaged butts and injurious fire scars should be cut. All defective trees of any size should be given to the logger. Only young, thrifty and rapidly growing trees should be marked as a part of the ten per cent to be left. This plan is followed out as nearly as possible; but there are cases, and they are in the majority, where it is impossible to follow the above outlined plan. Red pine grows in even aged stands, and while there are a good many stands of young, rapidly growing timber, there are a great many of the over-mature kind. In this latter case, the aim is to take the very best, going over the area and carefully selecting trees that are as healthy and free from defect as it is possible to obtain.

There is no iron clad rule regulating the cut to ten per cent of any one stand or division of land, but it must be ten per cent of the timber going to any individual purchaser. Consequently, in mature, over-mature, defective and heavily stocked stands it is desirable to mark the ten per cent low and add the scale to some of the open, scattered, healthy and rapidly growing types. Care should always be taken to leave seed trees in openings or along the edge of clearings and old burns whenever possible.

Danger from windfall is one of the main factors to be taken into consideration in marking. Extreme care should be practised in selecting a type of tree that will withstand the wind. Each tree marked should have crown enough for vigorous, healthy growth. Length and breadth of crown is compatible to a strong, well formed root system, which, in turn, has greater power and strength to resist the wind.

Innumerable differences and many problems will be encoun-

tered in marking a sale area, so that there is no set rule or rules that will apply to the entire tract. A rule in vogue in one place might be very much out of place in another.

Disposal of Brush

Under every well regulated system of management, red pine brush and debris resulting from thinnings or clear cutting should be burned or removed. In burning, of course, the brush should be piled where it will not endanger any of the remaining trees, whether large or small. Whenever and wherever possible, brush burning should follow the other operations closely, and should, under no consideration, be allowed to lag behind unless through danger of fire in an excessively dry season.

In summer logging, it is impossible to burn daily or to burn while the swamping is going on. Nevertheless, the brush should be swamped and piled, and should be burned after the first rainy weather, and by no means when it is dry, just because it may be easier and cheaper. This latter will not only burn the brush but also all of the vegetable and humus matter out of the soil, thus robbing it of its most valuable constituent. All small stock is destroyed and even the larger trees are badly fire scarred and damaged.

In winter logging, the brush should be piled and burned as it is cut; for at such a time there is considerably less swamping, the brush burns a great deal better, and the chances of a fire running through and destroying soil or endangering stands of trees or plots of reproduction is reduced to a minimum. The operation is carried on cheaper at this time, and in that respect makes it a business proposition for the logger.

Reforestation

Under the present silvicultural system as used on the Minnesota National Forest, there are but few areas that have been restocked successfully. Seed trees have had but very little to do with regeneration. Nearly all of the reproduction found on the timber sale area is confined to the edges of blocks of standing timber, or it is the result of the removal of old, over-mature

Clear cutting, allowing ten per cent of the stand to remain for seed trees

stands while the seedlings were from one to five years of age at the date of cutting.

The first timber sale was made in 1904, so that nine years have elapsed since the present system went into operation. It would seem that nine years ought to be a representative time for the reforestation of cut areas. It is certainly a sufficient length of time for a good seed year to have occurred and restocked the area, especially in the immediate vicinity of the individual seed trees. But, this is not the case. We find very little reproduction coming in, even in the neighborhood of standing trees that are young, healthy and vigorous. In a few instances, where a fire has happened to run over the ground the year preceding a seed year, the reproduction is coming in very plentifully. Otherwise, the ground is covered with grasses and low bushes that produce considerable litter and thus form a thick carpet. This effectually keeps the seed from reaching the mineral soil and germinating. In many cases, after certain logging operations, the reproduction comes in thick without any apparent reason, which circumstance can only be accounted for in that the seed has been stirred and shaken from the litter and deposited in the mineral soil.

Old, over-mature seed trees seldom if ever succeed in establishing a second growth. They have passed their stage of usefulness and no longer bear seed. Such areas can only be restocked by artificial methods.

In old, mature stands of red pine, there are usually enough trees so that the ten per cent for regeneration will leave three and four and even more trees to the acre. In case an acre produces 20,000 board feet, which is quite common, ten per cent or 2,000 board feet is left standing. The average timber sale stumpage price over the entire Forest is $8.50 per thousand. In the above case, seventeen dollars worth of seed trees are left standing for one individual acre.

On the other hand, three year old nursery stock once transplanted can be grown and planted out in the field for five dollars per thousand. (This figure is obtained from the actual cost of the different operations on the Minnesota National Forest.) In planting out the transplants, 8x8 foot spacing would be sufficiently close, thus making a total of about seven hundred plants to the acre. It seems as though it would be

far better to plant seven hundred transplants to the acre, with the idea that most of them will live, than to plant twelve hundred seedlings, with the idea that half of them will die.

Considering the fact that three, four and even five acres could be planted from the sale of the remaining ten per cent on the acre, why would it not be practical and economical to clear cut and plant the area? Then there would be the added advantages of having the area restocked, no land to be left idle and allowed to grow up to grass and low bushes for a period of years and no public sentiment against idle and useless land.

A Lookout on the Sopris National Forest

W. G. Baxter, '08—Forest Examiner

In selecting a site for a lookout station on the Sopris National Forest, the least of our troubles was to find elevation. Scores of peaks, projecting from 12,000 to 14,000 feet or more, are located all over the Forest in places suitable for taking observations at long range. It was found, however, that on excessively high situations the clouds and storms are so frequent that these become less efficient than lower points.

Mt. Lookout was finally decided upon because of its central location, its moderate height of 12,703 feet, its accessibility, and the fact that it is isolated from other peaks, so that approximately 459,000 acres or 70 per cent of the Forest is in view of the station on the summit. Part of this area, however, is situated in canyons and valleys which are not in direct view of the lookout; yet, a fire could be located by means of any smoke that might come into view.

It fell to the writer's lot to locate the 16 miles of telephone line connecting the peak with the supervisor's office, and later, in company with the guard on the peak, to build the upper mile of the line. He is frank to say that he was unable to find anything in his classroom notes or college text books that came anywhere near dealing with the subject; and it would probably be hard to find anywhere authority, or formulae, that would cover the methods it was found necessary to employ. On one especially steep part of the telephone right of way, one of the swampers suggested that we had better dig holes pretty shallow as there was danger of some of the bottoms dropping out.

The first part of the improvement to be considered was the building of a trail. Part of this was already constructed, and it was necessary to build only about five miles near the upper end to secure communication with the peak. When one considers that there were 32 coils of No. 9 wire, each weighing about 160 pounds, also insulators, brackets, telephones, sup-

plies, camp equipment, 800 pounds of barb wire for the lookout pasture, doors, windows, a stove, etc., for the lookout cabin, all to be transported over very rough country on pack horses, it is very readily seen that the trail must first be put into working order.

In locating a telephone line through tall timber, it is often necessary to swamp out a right of way on either side of the line to a distance equal to the height of the bordering trees, so that the line will be safe from any damage by falling timber. With a limited appropriation and some two-thirds of the line to be run through a stand of Englemann spruce and lodge-pole pine, this method was entirely out of the question.

The system, recently come into general use in the tree lines built by the Forest Service and known as the loose wire system, was therefore adopted. The single, grounded circuit is of No. 9 galvanized wire, strung on poles in open places, and fastened to trees, wherever it enters the timber, by being run through porcelain, split, tree insulators and being made to swing about six inches away from the tree by means of a piece of No. 12 wire, twisted around the insulator and fastened to the tree with three-inch staples. The line wire is left very loose, thus allowing it to slide through the insulators, and is kept from running down hill by being anchored with a tie wire on every eighth tree. The heavy, loose line constructed in this manner allows trees to fall across it without "putting it out of commission". Four or five trees have been found across the line at one time without any impairment of the service.

The lookout cabin, 10x12 feet and built of logs, is located at a spring one-half mile below timber line and one and one-half miles from the summit of the peak. There is an ordinary house telephone in the cabin, with an iron box set installed on the top of the peak. All of the telephone line above timber line consists of No. 9 galvanized wire strung on 14-foot poles, with the exception of the upper three-eights of a mile which is strung through tree insulators fastened to large boulders with three-eighths inch galvanized wire cable. The telephone box on the peak is fastened to two upright posts set in the rocks, and is protected by a stone wall built up around it. It is grounded at a distance of 75 feet by connection with a standard, 5-foot, telephone ground-rod driven full length into a fault in

the rock formation which is composed chiefly of a clay talc that remains moist throughout the summer months.

Each telephone is provided with a standard lightning protector and a single throw switch, because it was found that the protectors are not capable of grounding the excessive currents that sometimes occur on the higher parts of the line. Frequently during electrical storms it is necessary to disconnect the telephone in order to render the lookout cabin habitable.

A traverse board with a map of the Forest is oriented on the peak and is protected by having a galvanized pan telescoped over it. When a fire is sighted, its azimuth is determined by means of a protractor which is drawn on the map and an alidade. In a flat country it would be very difficult to determine the location of a fire without using a system of triangulation from two or more lookout stations, but, in this rugged topography, the lookout not only reports the azimuth of the fire but also locates it with reference to a known peak or valley, so that, with the knowledge of local conditions, the Supervisor or ranger concerned can usually locate the fire fairly accurately.

During the past fire season a guard was stationed on the peak from June 26 to September 20, during which time a total of 17 fires was reported. When not actually needed on patrol work, the guard worked on the telephone line, lookout cabin, pasture fence, trail, or other improvement work in the vicinity of the peak.

During the above period, approximately 35 per cent of the days were clear, 50 per cent were hazy or partly cloudy, and 15 per cent were stormy to such an extent that moderately dense smoke probably could not have been observed. During the days that are partly cloudy throughout the summer small squalls of fog, rain, or hail occur in the vicinity of the peak, making it ineffectual as a lookout point, while some parts of the Forest are enveloped in low hanging clouds so that a small smoke could not be distinguished. At such times, however, there is always a large area clearly visible, and, as the clouds are usually shifting about, eventually all of the territory can be observed.

The lookout station would be more efficient if the cabin were located on the summit of the peak, but on account of the lack

of water, absence of fuel, and the nature of the very violent electrical storms, this plan has not been attempted. As the last three-eighths mile of the route to the peak must be climbed on foot, the packing of wood, water, and supplies would be of considerable expense, especially since snow lies on the peak perpetually, and the cold days and nights even in summer would require an increased amount of fire wood.

Last but not least of the improvements is the 5x9 feet of Old Glory that always floats proudly from the 22-foot flag pole on the peak. The significance of this flag is better appreciated by Lookout Shields and myself because of the fact that we carried the heavy spruce pole on horseback, a distance of a mile, and then struggled over the three-eighths of a mile of granite boulders with it on our shoulders before finally planting it where it now stands.

Stumpage Appraisals Involving Use of a Railroad

A. F. Hoffman, '11—Forest Examiner

The object of this discussion is to call attention to the factors considered in appraising stumpage, rather than to give a detailed plan of procedure. Few areas present similar conditions, and consequently new problems are always at hand.

Efficiency in appraising stumpage values comes largely through experience in the work, and set rules and regulations will serve merely as a guide. To the experienced man, no doubt, the contents of this paper will present few new facts, but to the uninitiated, it will give an idea of the various matters included in a field study of this character.

All of the factors that must be considered will be taken up in the order in which they arise as the log proceeds from the timber to the cars. When all woods and sawmill work become standardized, set rules can be laid down for many of the logging activities, but at present the methods vary greatly with the individual operations.

Preliminary Work—Surveying and Estimating

The first thing to be done on a prospective timber sale area is to determine the actual amount of land covered with timber and what part of the area is merchantable. In addition, it is absolutely necessary that a very accurate estimate of the merchantable timber be made and the percentage for cutting determined. Inaccuracies in this work will directly affect the stumpage price, in as much as the final costs are all reduced to a basis of one thousand feet board measure, the amount being dependent upon the density of the stand as well as upon other factors.

While the tract is being surveyed to secure this data, the exterior boundaries should be blazed and the corners well marked by self explanatory stakes. This helps to keep the

timber sale area under better control while the work is in progress.

The estimate of the standing timber must be obtained by using some method of reconnaissance which will be both intensive and accurate. Different species and different stands have their best methods, and that one which is most applicable should be used. While making the survey, full notes on all points that might be of use should be made. These should include the location of possible mill sites, swamps, down timber, and, in fact, anything of importance that a topographical legend will not show. The survey will not be complete until enough data is secured to allow the making of a map that will show everything pertinent to the logging operations. This map should include the location of all areas that require peculiar methods of logging. For instance, there might be a high mesa which should be logged from a camp on the mesa. It may be cheaper to "chute" the logs than to build roads to the top, or the mesa may be a "dry" one, necessitating the establishment of a "tank" camp or the resorting to the use of snow for water for stock and domestic consumption. All such conditions should be shown and in such a way that anyone can readily realize the problems involved. Then intelligently planned operations will be possible.

Construction Work.

Of equal importance to these activities is the choice of the proper sized mill for the operation. This will depend upon the market for the product and the woods investment. Knowing this latter, the annual cut and the date of the final cut can be set. These figures are further necessary for figuring depreciation and interest charges. The character of the timber and method of logging having been determined, the amount of stock and the number of men needed to log to the mill and to operate the mill itself can be determined. In an operation involving the use of a railroad there may be a choice between two methods of logging. If the area is level, it may be possible to run a number of spur tracks into the woods and use steam power for handling the logs. In such a case a smaller outlay for animal power will be necessary than if the topography is so rough as to necessitate wagon or other methods of hauling. If

the area comprises much swampy, brushy or dangerous ground, or if many large logs will be handled, the use of oxen may be more economical. There may be use for both oxen and horses, and the number of each will be in proportion to the amount of each kind of logging that will be encountered. Horses are preferred for ground that is easy to work on.

It is usually necessary to purchase live stock at some live stock market, and from this source data for fixing this cost can be secured. In figuring depreciation charges, it is considered that horses will last about ten years and oxen about eight.

For hauling in the woods, either the use of trucks or of "two wheelers" will be possible. For long hauls and rougher ground the former should be used; for short hauls of any kind, the latter are to be preferred.

A rough or preliminary survey for the railroad must be made and the location of the mill and all camps must be indicated. The cost per mile for the railroad and its total length in terms of main line and spur track will be computed from this survey. It is to be remembered in this connection that the cost for spur line track is not as great as for main line and that too much main line should not be anticipated. The character of the ground, the amount of rock work, bridging, cutting and filling are essential points for consideration. Also, the distance from available tie timber influences the cost of the railroad. As much of the railroad as possible should be constructed after the mill is running, in order that ties cut at the mill may be used in the construction work. Second hand steel can usually be rented from railroads for a specified sum per year per track mile, and calculations will show whether or not this rental will amount to more than the purchase price of new steel. When steel is purchased, the interest on its cost as well as the interest on the cost of spikes, bolts, plates, etc., must be considered.

The preliminary survey will show whether or not it will be possible to lay spur tracks into the woods sufficiently close to permit the use of steam skidders and car camps, or whether stationery camps should be constructed. In the latter event, wagon hauling from the woods to the track would usually be necessary. Allowance must be made for switches which will

be required on hills over which the loads must be "doubled up", and also at most of the skidway sites.

The location and probable cost of all of the woods roads must be carefully considered and can be determined only by actually going over every foot of the ground, because the cost of construction over various kinds of ground differs so materially. Rock work, soft or wet ground, bridges, cuts and fills must all be figured separately. Some areas are distinctly winter-logging propositions, requiring the construction and maintenance of snow roads for hauling. This method is especially applicable in the case of long hauls where big loads are possible, due to the lay of the ground. Some preliminary grading is usually necessary for snow roads. In any case, the purchaser of the timber should be allowed an adequate amount for the construction of *good* logging roads, but care must be taken to distinguish between the roads over which much must be hauled and those over which little will be hauled.

The location and cost of constructing skidways along the railroad should be considered along with the cost of roads. Here again, the expense of making *good* skidways should be allowed, since *cheap* ones always increase the cost of handling the logs.

The size of camps depends upon the number of men to be housed. Sometimes the operators charge the men house rent, and in such a case there should be no charge made against the logs for that part of the camp. The size of barns depends upon the amount of stock to be housed, which in turn, depends upon the size and duration of the operation; so that the amount of timber that will be handled from a camp decides the cost chargeable against each thousand feet for this item. Three kinds of camps are possible: tent camps, car camps and board camps, or combinations of the three. The amount to charge against the logs is the actual amount that the company will be out for the buildings at the end of the operation. Should there be an opportunity to sell any of the old lumber used in the buildings when the camp is discontinued, then the amount realized should be deducted from the cost of buildings before this is charged against the logs.

The shacks are sometimes placed on skids, loaded on log cars and moved to a new site.

Woods Work

The charge for cutting should include the cost of felling, sawing into logs, and limbing. It is rather difficult to set the proper price for this operation and the closer the woods are studied the more accurate this charge will be. The distance from camp, the degree of slope and character of the ground, the size of the timber, its quality as regards freedom from limbs, the size of the limbs, the amount and density of the brush in the woods, the ability of the saw filer, the depth of the snow, and the frequency of the loading places, are all factors which must be given consideration. Of these, the last, together with the size of the timber and the character of the land, are the main factors to consider.

The cost of skidding will depend largely upon the ability of the woods foremen. Where the country is rolling or level, short skidding distances are possible, and a lower charge for this operation results. In dense brush, deep snow, or swampy ground, or in handling large logs, oxen can be used with good results, while in open, level country, horses should always be used.

The cost of brush disposal naturally depends upon the size and number of limbs and the method of disposal; i. e., whether it is to be scattered or whether it is to be piled and burned. In certain localities, the old idea of piling and burning is losing favor, and the method of scattering the brush without burning is thought to be the cheapest and most practical as well as best silvicultural method. If the operator has a market for hewn ties and mine timbers that can be made from the tops, then the cost of brush disposal will be lessened because there will be less of the tops to lop. If there are any special phases of brush disposal required, such as throwing brush into old skid trails and roads or into washes to prevent erosion, then the operator should be allowed the additional expense. On National Forest lands, a good method for the operator is to contract for this work at a specified price per thousand feet, Government scale. By doing this he saves the cost of supervision, since it is the duty of the Forest officer supervising the sale to pass upon the quality of the work.

The cost of hauling the logs from the woods to the skidways is dependent upon several things, first of which is the size of

horses to use. This is a very important matter. In a level country heavy horses are desirable, say 1600 to 1800 pound wheelers and 1400 pound leaders. In a rough country lighter horses must be used since the heavy animals can not stand the hills. There are also places where oxen can be used to advantage, and in figuring the charge for feed for them, the amount of forage in the woods that can be utilized as feed should be considered. A good way to use oxen is to assign them to the hard logging propositions and make them both skid and haul their own loads.

The length of the haul, measured in terms of number of trips per day, is the second important factor influencing the cost of hauling. If the roads slope all of the way to the camps or skidways, then big loads are possible, but if a hill is encountered, the size of the load must be reduced unless it is planned to "double up" with an extra team where the grade is steep. Large loads mean less trips per day, and hence shorter total length of haul in the number of trips per day. The amount of sleigh logging that will be possible will have a similar influence and must be considered, keeping in mind the fact that usually a fifty per cent larger load can be hauled on a sleigh than on a wagon.

The cost of blacksmtihing, horse feed, and wages for feeding should be pro rated to the different operations concerned, according to the number of horses used on each.

The upkeep of the woods roads is an item to be distinguished from the cost of construction of the roads. Careful observations must be made before the appraiser is enabled to make an accurate estimate of the cost of upkeep. He must make these observations while the ground is bare of snow because the wearing quality of the dirt has a great effect on cost of upkeep. Where corduroys are constructed considerable repair work will have to be done after they have been in use for a year. Bridge floorings on roads where much hauling is done will also have to be renewed often. On woods roads over which 30 to 40 thousand feet b. m. are hauled daily, it will require the services of laborers continually to keep the roads in repair, the number depending on the length of the road. Chuck holes and repairs on corduroys and bridges will be the

main worries. Cull lumber should always be figured for repair work.

Railroading

For the loading work, a choice will be possible between steam loading and the cross haul method, using horses. The type chosen invariably depends upon the size of the operation. Five men and two horses can load 70 to 80 thousand feet b. m. per day and will do the work cheaper than a steam loader, if the loading crew does nothing but load. The latter will do it quicker, and, if they can also do some skidding, it is generally preferable to the other method. If the spur tracks run right into all parts of the woods, then the steam loader will both skid and load, and the old cross haul method should be abandoned. In deciding which to use, the cost of loading by each method should be figured. The expense chargeable against the steam loader will be the wages of the crew, cost of fuel, oil, upkeep, and depreciation, and interest on the investment.

The cost of the railroad haul is best determined by comparison. The length of the haul and the grade of the road, together with the number of cars handled each day, are some of the factors that must be known, as is also the cost of coal, or of oil, if oil burners are used. The amount of fuel required and the cost of train crews can be found by comparison with a similar run. If the log train runs over the tracks of a common carrier on any portion of the run, a conductor and two brakemen are necessary, but over logging railroad track, a conductor and one brakeman are usually enough. The train crew must be allowed time for switching, the amount depending upon the manner in which the yards are laid out. This charge is usually about ten per cent of the total railroad operation charge. The cost of unloading the cars and getting the logs into the pond is usually only three or four cents, and so is unimportant.

The cost of upkeep of the right of way and rolling stock is considerable. The cost for tie renewals is figured by considering the length of life in years for the ties and then figuring an annual renewal of one in that number. For example, if yellow pine ties are used, there would be an annual renewal of one in six, since six years is the average life of a western yellow

pine tie. Cull ties from the mill should be used for renewals, and the rate of replacement in this case should be made one in four rather than one in six. When the steel is rented, the railroad supplying it furnishes the rails for replacement. Little, if any, ballasting need usually be counted on.

The rolling stock is constantly in need of repair, and the cost of this depends much upon the original quality. Upkeep on second hand stock will be more than on new stock, and whether new or second hand stock is to be used will be a matter of personal judgment backed up by the advice of a mechanic who is familiar with the rolling stock that will be used. The log cars will have a longer life if they are of the modern class, like a "Russell", than they will if they are of the old fashioned, all wood type.

Milling

The efficiency of the mill will depend largely upon the ability of the sawyer and the other high salaried men in the mill, and therefore, good salaries should be allowed in making stumpage appraisals.

Much depends upon the quality of the mill-site. The appraiser should take into consideration the adaptability of the mill site and yards for efficient and economical handling of the logs and sawed products. There are many chances for this factor to vary in a mountainous country.

It must be assumed that the best and most economical methods will be used, and then there must be taken into consideration any factors that will cause a deviation, and allowances made for them. It requires much experience to fit a man for accurate appraisal of the milling end of a lumbering operation.

The charge for milling should include the cost of scaling, sawing, sorting or grading, transportation within the mill and yards, edging, planing, drying, piling, and loading on the cars ready for market. There is also a charge for pond expense, which includes moving the logs in the pond and cleaning the pond at intervals.

The operators should also be allowed something for installing and maintaining a fire protection system in the yards and mill.

Overhead Expense

The cost of supervision should include only the salary and expenses of a general manager. The salaries of all of the foremen are charged directly to the part of the operation that they are given supervision of.

The cost of bookkeeping will depend largely upon the capacity of the mill, the size of the commissary, and the number of camps in the woods.

The charge of selling depends upon the market. If inferior species are cut and they are competing with a better species, the marketing item will be high. If a retail yard is maintained in some city away from the mill, the cost of selling will be higher than if the product is sold only by salesmen.

The charge for insurance is always high because saw mills and lumber yards are always considered as a big risk. The best way to get at this cost is to secure rates from a local agent. The charge for taxes will also be secured from local sources.

Depreciation is the loss in value of the plant and equipment that is not made good by upkeep and includes all equipment in the woods. As stated in a Forest Service circular letter: "It is usually met by charging against annual operating costs a certain portion of the investment; that is, by gradual reductions charged against costs of operations, the investment is kept at its actual value, and the depreciation is thereby accounted for in the costs of production and net earnings".

If, for instance, the operations will continue for five years, and there will be $20,000 tied up, and the outfit will deteriorate at the rate of one-fifth of itself each year, the method of fixing the depreciation and interest on investment is according to the following table:

Period of Operation	Investment on Which Interest Must be Paid	Actual Interest at 6 Percent	Depreciation at End of Each Year
First year.....	$20,000	$1,200	$ 4,000
Second year.....	16,000	960	8,000
Third year.....	12,000	720	12,000
Fourth year.....	8,000	480	16,000
Fifth year.....	4,000	240	20,000

The charge for obsolescence is a rather difficult one to determine. It affects that part of the equipment that is the most

intricate. Usually it is safe to say that after a period of ten years enough improvements will have been made upon such machinery so that the substitution of the improved piece will be profitable.

Equally as important as the knowledge of the cost of operation is the knowledge of the selling price of the product. When a sale is being made to a new operator, the only way to get this is to find out what prices are obtained by the concerns with which the buyer is going to compete. If the purchaser is already operating, his past prices should be used, subject to any changes in the market. It is always well to cooperate with the purchaser in determining this selling price. The value of the mill run, that is, the figure obtained by dividing the total amount obtained for the entire product of the mill by the number of thousand feet this product represents, gives the selling price. The value of all by-products, such as hewn ties and mine timbers made from the tops, must be included here.

Unless it is possible to secure very good figures on overrun from some mill that is already operating in timber similar to that being sold, this factor should be given very careful study. When reliable data are at hand, the costs of operation from the stump to the mill should be based on log scale, but the costs after milling should be based on the actual amount, board measure, sawed from the logs.

Determination of Stumpage Price

The Forest Service now uses a formula for fixing the stumpage price, after the cost of operation and the selling price are known. Its principle in brief is that the difference between the selling price and the cost of production contains both the stumpage price and the operator's profit. A statement of the formula is:

$$(S \div P) - O = X,$$

in which S is the selling price, P is 1+ the per cent of profit, O the cost of operation, and X the stumpage price.

Assume an operating cost of $12, an average selling price of $17, and a per cent of profit of 20. By substituting these values in the formula, a stumpage price of $2.17 is obtained as follows:

$$(\$17 \div \$1.20) - \$12 = \$2.17$$

The per cent of profit should vary with the risk involved and the magnitude of the operation.

Below is an outline of the factors considered above:

I. Preliminary Work.
   A. Surveying.
      1. Find amount of timber land.
      2. Find amount of non-timber land.
   B. Estimate.
      1. Total stand.
      2. Amount to be cut.
   C. Map.
      1. Should show everything pertinent to logging operations.

II. Determination of Operating Expenses.
   A. Construction Work.
      1. Railroad.
         a. Main line.
         b. Spur lines.
         c. Switches.
      2. Woods roads and bridges.
      3. Camps.
      4. Skidways.
   B. Woods work.
      1. Cutting.
      2. Skidding.
      3. Brush disposal.
      4. Hauling.
      5. Feed and blacksmith.
      6. Road upkeep.
      7. Moving skidways.
   C. Railroading.
      1. Loading on cars.
      2. Hauling to mill.
      3. Unloading.
      4. Switching.
      5. Upkeep of equipment.
      6. Upkeep of right of way.
   D. Milling.
      1. Pond expense.
      2. Scaling.

3. Sawing.
4. Edging.
5. Planing.
6. Drying.

E. Yarding.
1. Sorting.
2. Transportation.
3. Piling.
4. Fire protection in yards and mill.
5. Loading on cars.

F. Overhead expenses.
1. Supervision.
2. Bookkeeping.
3. Legal and incidental expenses.
4. Selling.

G. Fixed charges.
1. Insurance and taxes.
2. Depreciation.
a. Of plant and buildings.
b. Of equipment.
c. Of railroad.
3. Interest on investment.
4. Obsolescence.
5. Wrecking value.

III. Determination of Stumpage Value.

A. Find selling price.
1. Count in value of by-products.

B. Find stumpage price by use of formula:

$$(S \div P) - O = X$$

in which S = selling price, P = 1 + % of profit, O = the cost of operating, and X = the value of the stumpage.

Ex-12, Ex-Guard, Ex-Ranger

L. P. Wygle

Many young men now interested in the study of Forestry in the schools of the United States have spent some part of their summer vacation at least with the Forest Service as guards or field assistants; and all of those that have, were bundles of enthusiasm from the first moment of work. This enthusiasm grew even after camp broke for the last time. Reluctant "goodbyes" were said, and memories of a most enjoyable and profitable vacation were told at gatherings before and after classes during the whole of the following year of school.

The average Forestry student is apt to be lured by the apparent free and picturesque life of the Forest rangers he has observed during his summer's work, and to be tempted to "lay out" a year to work in the Service and become a Forest ranger. He reasons that he is as full of red blood as any man, and has the other qualifications that go to make a good ranger.

"Have I not a start on a technical education?" he asks himself. "Can I not speak the Latin names of the trees, shrubs and forage plants? Then why would I not make good as a Forest ranger?"

He feels that he can easily work in that capacity for a year, and, with his first hand experience, go back to school and feel that he is better fitted for the B. S. degree in Forestry.

A young man once had such views and proceeded to carry them out—almost—for he did not return for his degree. He received an appointment as Forest guard on the Plumas National Forest in California.

Upon reporting to the Forest supervisor for his first instructions, he was sent to a remote sawmill and logging camp to act as scaler. He had never before seen a sawmill and was somewhat skeptical concernig the outlook of a life among "lumberjacks". Even after arriving at the mill, his ideas were not raised by appearances of either buildings or men. Thoughts of the vacant chair in his Eastern home insisted on coming to

him, try as he would to be brave and force them aside. The lumberman for the Service was on hand, and, after assisting the new guard by helping him fill his bunk with hay and introducing him to a few of the men about camp, he gave the guard a few instructions regarding scaling, and then departed to carry on other duties.

From the start, the guard received valuable lessons, acting in the capacity of agent between the Forest Service on one hand and a corporation on the other. His knowledge of eastern lumber markets, defects and diseases of logs and merchantable timber was good technically, but poor practically. Hence, a great deal of guessing was done at first. However, with a Company scaler checking him on every log, he was able at the end of two months to know a log in a dozen different ways; and know them he must, for the Company scaler was an old and experienced man who would split hairs to get the best of the Government scaler. No official relation existed between these scalers, and certainly a very small friendly one. The lumberman in charge of the timber sales found plenty of room for improvement in the methods of his subordinate's scaling, but he was patient and explained each detail specifically. Midnight oil was burned often to make sure that reports were correct and that they checked to the one-half cent, because a copy of each weekly report was to be sent to the District Forester, the Forest supervisor and the lumberman in charge of the local sales; and the scaler had received his reports back on two occasions with a curt letter asking for greater care.

He soon became more familiar with his work, and with greater familiarity came greater confidence. His interest increased, and no opportunity was lost to learn more of the science of scaling.

The guard wrote letters home, full of glowing accounts of his work, of how enjoyable it was, of how he loved the life; and yet, he carefuly left out any hint as to his experiences at the hands of joke-loving "lumberjacks", the eventless evenings (save for the entertainment furnished by a family of skunks that did their nightly quarreling underneath his 6x8 cabin floor,) and early morning breakfasts consisting of soggy hot cakes, greasy bacon and strong coffee.

The diversion offered, when the mill was closed down by its

owners because of an overstocked yard, was more than welcome. The guard was ordered to report to a ranger some miles distant, to assist in the building of some improvements on the station grounds; but a cloud of smoke coming from behind a ridge of forest covered hills told of a more important duty. Several of the idle mill hands were called into service and were soon on their way to a fire with the embryonic Forester in glorious command. Rangers had already seen the smoke from their stations or had learned of it by telephones, and were coming in by one's and two's. The fire was a stubborn one, and in the following four weeks the guard learned the full significance of the clause describing the necessary qualifications of those aspiring to rangers' appointments which reads thus: "He must be able to perform hard labor under trying conditions." He was willing to work and held his own with the rangers, growing well acquainted in the mean time with a multitude of facts concerning the successful handling of men on the fire line, as well as the fighting of different kinds of fire.

When the fire was out and the Ranger's Station had been reached, the guard took a personal inventory. He found that his clothes had been burned and torn beyond repair, that his boots were reduced to sandals, that his face was covered with blisters and peculiarly colored patches of whiskers, and that his hair was long only in spots, burning cinders having removed parts of it. He had lost twelve pounds in weight, and not a little of his desire for a ranger's berth. He thought it strange when one of the departing rangers said to another, "Well, Jim, if I have a fire over on my district when I get back, I'll send for you to come and help put it out," and the reply came back, "Sure I will; that's the only time we have for a little fun except at the ranger's meeting." The guard had seen nothing even hinting at fun, unless a day's work with a shovel ,axe, brushhook or rake, breathing dust and smoke, could be called fun.

After a day's rest, the guard was called into the supervisor's office, told to go to a large timber sale sixty miles distant, and use every means to collect a good quantity and quality of pine seed. Here was a new field, and here again the guard found his technical knowledge good but his practical information undeveloped. He worked on a logical basis and soon had a sys-

tem working, for which he received favorable mention from his Supervisor and from the District Forester. He had learned the importance of tact and used it. He was assisted in many ways by men with whom he came in contact. He made friends among the loggers, and they assisted him in locating cones whenever possible, incidentally nicknaming him "Pine Cone Pete."

At the close of this work he was transferred to the planting crew, where he became perfectly acquainted with the business end of the grub hoe, garden hoe and rake.

As the date for the examination for rangers was approaching, he spent his evenings in front of the camp fire, studying subjects which had not yet come into his experiences. On the day before the examination he tramped twelve miles across country to the place where it was to be held, and spent the two following days in struggling through the ordeals of the examination.

He was then transferred to the lower portion of the forest, where he was to assist an old ranger in taking care of 115,000 acres of timber land known as District No. 6 of the Plumas National Forest. Here he ran into the real test of fitness for following the life of a Forest ranger. The season being winter and operations being slack, he spent several days painting and lettering sign boards to mark roads and trails through the District, and drawing grazing maps (which were returned because of poor draftsmanship). When the rain ceased and snow came, he spent his time land-surveying, cruising, burning brush on sale areas, improving ranger station facilities, surveying out special and free uses for inhabitants and repairing the telephone lines, all of which had to be done on skiis, the snow being too deep to permit travel by horse.

It was here, too, that he received some novel experiences as an ex-officio game warden. A band of Greek laborers were employed in a railroad construction camp some miles distant and were violating the game laws by sending men from their number out to furnish their table with "out-of-season" venison. The guard started investigations and found plenty of evidence. A warning of this was sent to the Greek's camp in some unknown manner, and a few days later, while following a trail carrying conclusive evidence, a screaming ball from a high power rifle

struck an arm's length from the guard. The ball came from a steep and densely wooded hillside some few hundred yards distant, and besides carrying its message, gave the guard an opportunity to claim a record for time consumed in making one's self invisible behind small trees. The offenders were brought to justice, but a more strategic method was employed in their capture.

With the coming of spring and the going of the snow, operations were resumed in the northern part of the Forest. After five months experience on District No. 6, the guard was transferred to the extreme northern part where he assisted another ranger in surveying the Forest boundary line, building fences to improve the station, laying a pipe line from a spring in the hills back of the station to the house, repairing the sheep counting pens, etc.

With the advent of spring came the usual large droves of sheep, goats, cattle and horses that are users of the National Forests for the grazing season. The ranger's duties were to count each drove of such stock, recommend the grazing charges to be made against them, and act as chaperone to each drove as they went over the special driveway to their allotted range.

The guard by this time was beginning to know some of the duties of the Forest ranger and was made jubilant by receiving notice of his success in the ranger examination and a promotion from Forest guard to Assistant Forest ranger.

Other work being rounded up and started in good shape in this District, the new Assistant ranger was transferred to the telephone crew, and for two weeks acted as lineman on this crew.

The completion of this work found it the 10th of June, and while waiting for the saw mills to begin operations he was sent to a newly established reconnaissance camp where he met two of his old college friends, together with several men from other colleges. In the following days he enjoyed a taste of his old college life, which, when transferred to the camp of a group of Forestry students, is the most enjoyable and congenial one can conceive of, and requires a talented author to describe.

The Assistant ranger soon after was notified of the opening of the sawmills and was ordered to report to a large logging camp far in the northern part of the Forest where he acted as

scaler until the close of the season. After assisting in a post-season reconnaissance and cruise, he was furloughed to return to college and resume his course in Forestry.

He returned to the Plumas Forest the following year and the call of the woods has kept him in the woods work, though not in the Forest Service. He has now completed a year in the employ of a large logging company, operating on the lower Columbia River. The experience gained while with the Forest Service has been of daily use to him in his work, and the call of the strenuous life of the Forest ranger is still strong within him. The memories of many small successes or failures encountered during those years are sources of great enjoyment when lived over with the aid of a diary and a collection of snapshots.

In conclusion it may be well to say that the one thing a man should possess, who intends to follow Forestry as a profession, is the power of using tact in all his dealings. When a man is given a Forest Service badge, he is invested with a certain amount of authority that requires very careful handling. Failure to use due tact, especially with such persons as forest users or outsiders who love to argue against the policies of the Service, easily "gets one in bad" and once "in bad" it is very difficult to get back into the good graces of men who are so easily made enemies to the Forest Service. The Forest officer will have problems confront him in every manner, and he must be able to see quickly the other person's point of view before acting. This applies to everything pertaining to life in the Service, from the handling of a sale of a million board feet of lumber down to the granting of a free use permit. The public are the users of National Forests, and the Forest officer is the agent who must conclude all permissable deals in a manner satisfactory to both parties.

Grasses of the National Forests of the Rockies

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In the revised edition of the Manual of the Botany of the Rocky Mountain region by J. M. Coulter and Aven Nelson* something over 220 species of grasses are listed. These are distributed in 65 genera. In a paper on the grasses of the Uintah Mountains and adjacent regions by the writer, 126 species are listed and 36 genera.† Thomas Howell, in his "Flora of Northwest America", lists about 315 species of grasses including the varieties. Among the species found in northwest North America are many introduced plants, a larger number than in the Rocky Mountains. In the Pacific Northwest there are a great many more species of Agrostis, 23 in all, than in the Rocky Mountains, where the genus is represented by only 9 species. The Rocky Mountain region has 10 species and varieties of Calamagrostis, whereas, there are 23 in the Pacific Northwest. There are 25 species of the meadow grasses (*Poa*) in the Rocky Mountains and 41 in the Pacific Northwest. Brome grasses (*Bromus*) have 26 in the Pacific Northwest and 10 in the Rocky Mountains; mesquite grass (*Bouteloua*) a single species in the Northwest, and then, only on the eastern border of Washington and Oregon, and 4 species in the Rocky Mountain region. Of the grasses mentioned above the genus Bouteloua has a diverse range, extending from Mexico to the Eastern States, but nowhere else does Bouteloua reach so great a development as in the region west of the 100th meridan and east of the Northern Rockies, and in the Southwest. The meadow grasses (*Poa*) are typical of the mountain meadows and northern regions, though some species work out on the plains, like the meadow grass (*Poe arida*) and Blue grass (*Poa pratensis*) which is frequently associated with hair grass (*Deschampsia caespitosa*) and blue joint (*Calamagrostis*

* A Manual of the Botany of the Central Rocky Mountain region. Vascular Plants. Am. Book Co., 1909.

† Proc. Ia. Acad. Sci. 1913: 133-149.

Blue Grass (Poa pratensis). A—Spikelet with several flowers. B—Cobwebby hairs on lemma. In the Rocky Mountains and the eastern states. (U. S. Dept. Agr.)

Hairy Brome Grass (Bromus marginatus.) A—Spikelet with three florets. B—Dorsal view of lemma. Common in the northern Rockies. (U. S. Dept. Agr.)

neglecta). In the Alpine meadows of the Colorado district *Poa Lettermannii,* and Chess, or Brome grass (*Bromus*), are plants of the mountains, stream and meadows except as the introduced species occupy waste places.

The grasses are so important to the forester that a few of the more common species of the forest reserves should be recognized. They are, of course, among the most difficult plants to recognize. Many of the species are so widely distributed and occur under so many different conditions that it is difficult always to mark their limitations. This is true for such grasses as common blue

Spikelet of Slough Grass (Spartina cynosuroides.) Lower scales sterile glumes, the third scale lemma, fourth scale palea, followod by stamens and pistil. (Gray-King).

Gama Grass (Bouteloua curtipendula). Lower scales; third scale lemma; fourth scale palea. (Gray-King).

grass (*Poa pratensis*) which occurs in mountain regions generally in the West. The mountain timothy though common in the Rocky Mountains is a fairly constant species. A few of the grasses are easily recognized; Alpine timothy by its black head; Squirrel tail by the bushy top; Melica by the bulbous "root"; meadow grasses by the cobwebby lemma (some, of course, not being cobwebby). A few of the grasses have involute leaves (like *Festuca ovina and F. rubra*). Twisted, annual seeded grasses belong to Stipa (a single awn) and Aristida with a 3-branched awn. Some of the wheat grasses have many root-

stocks and a rachis that is zigzag. The following key will help somewhat to identify a few grasses:

A. Rachilla articulated below the spikelets, falling away entire, 1-2 flowered (spikelets in pairs, one sessile, the other pedicellate, Blue Stem (*Andropogon*) on the plains. Hilaria with inflorscence in a terminal spike, New Mexico).

B. Spikelets with persistent glumes, the rachilla articulated above them.

1. Spikelets 1-flowered.

a. Lemma with long terminal awn.

aa. Awns 3-branched ..... *Aristida*

aa. Awns simple, twisted..... *Stipa*

b. Awns comparatively short.

bb. Sheaths smooth.

c. Plant slender..... *S. columbiana*

c. Plant stout..... *S. viridula*

b. Awn long..... *S. comata*

a. Lemma awnless or with a short awn.

aa. Inflorescence a dense spike..... *Phleum*

b. Upper sheath not inflated, color greenish.. *P. pratense*

b. Upper sheath inflated, color dark..... *P. alpinum*

aa. Inflorescence loose.

b. Pericarp discharging the seed..... *Sporobolus*

b. Pericarp not discharging the seed.

c. Lemma naked at base..... *Agrostis*

c. Lemma with a tuft of hairs..... *Calamagrostis*

1. Spikelets 2 to many flowered.

a. Awns usually dorsal and usually bent.

b. Lemma erose truncate..... *Deschampsia*

b. Lemma 2-toothed ..... *Trisetum*

a. Awn of lemma terminal between the teeth..... *Danthonia*

1. Spikelets in two rows sessile or nearly so in a one-sided spike.

a. Flowers perfect.

b. Spikelets falling off as a whole. Spikelets flattened *Beckmannia*

b. Spikelets in part persistent.

a. Flowers imperfect. Staminate and pistillate..... *Buchloe*

1. Spikelets 2 to many flowered. Lemma usually longer than the glumes.

a. Awn terminal, straight, lemma usually shorter than the glume.

b. Inflorescence spike-like, lemma 3-nerved..... *Koeleria*

b. Inflorescence in an open panicle. Lemma 5 or more nerved.

c. Upper florets sterile, folded about each other, bulbous ..... *Melica*

cc. Stigmas below the apex of the ovary.

ccc. Spikelets with upper floret abortive *Bromus*

d. Lower glume 1-nerved..... *B. Pumpellianus*

d. Lower glume 3-nerved, sheaths hairy ..... *B. larginatus*

cc. Stigmas arising at the apex of the ovary.

d. Lemma compressed and keeled.

dd. Awnless ..... *Poa*

e. Lemma webbed.

ee. Panicle large, not reflexed..... *P. pratensis*

ee. Panicle small reflexed
P. reflexa
e. Lemma not webbed.
Panicle large..*P. nevadensis*
Panicle small..*P. buckleyana*
d. Lemma convex or rounded..*Festuca*
e. Leaves involute.....*F. rubra*
e. Leaves broad and flat...
F. scabrella

1. Spikelets in one sided, jointed, channeled rachis.
a. Spikelets generally solitary on the rachis.....*Agropyron*
b. Creeping rootstocks absent.....*A. tenerum*
b. Creeping rootstocks present.
bb. Spikelets dense 7-13 flowered, leaves rough on edge .....*A. Smithii*
bb. Spikelets 3-8 flowered.
bbb. Glumes short, ½ the length of the spikelet
A. dasystachyum
bbb. Glumes longer, ⅔ as long as the spikelet
A. pseudo-repens
a. Spikelets 1-flowered, the mature plant readily breaks into pieces .....*Hordeum*
b. Spikes with spreading awns, usually reddish.....
H. jubatum
b. Spikes narrower; awns erect.....*H. nodosum*

Some of the more important and common grasses of the forest regions of the Rockies are as follows:

Western wheat grass (*Agropyron Smithii*). Ranges from western Iowa to the Pacific coast in open places and on plains at lower altitudes.

Slender wheat grass (*Agropyron tenerum*). Along streams and in meadows in the Rocky Mountains; common at lower altitudes, particularly in Wyoming, Montana and northern Colorado.

Awned wheat grass (*Agropyron dasystachyum*). With creeping rootstocks; common in open woods and meadows with dry soil.

Short awned Brome grass (*Bromus marginatus*). A tall grass; common at low altitudes in northern Wyoming, Colorado and Montana, but less common in New Mexico along the streams and in the meadows.

Awnless Brome grass (*Bromus pumpellianus*). Found far northward and westward, occurring in northern Colorado in moist parks.

Fescue grass (*Festuca rubra*). In dry places, growing in benches everywhere in the mountains of Colorado.

Bunch grass (*Festuca scabrella*). One of the fescue grasses; common everywhere in drier mountain parks of Colorado, Wyoming and northward.

Blue grass (*Poa pratensis*). Common in moist mountain parks and meadows in the Rockies. This grass is truly indigenous in the Rockies.

Meadowgrass (*Poa Lettermannii*). At high altitudes in the Rockies, Gray Peak, Mount Ouray, etc.

Nevada blue grass (*Poa nevadensis*). Forms benches in open woods.

Buckley's meadow grass (*Poa Buckleyana*). Occurs in the open, dry, semi-arid regions.

Mesquite grass (*Bouteloua oligostachya*). Common on the plains and in the foothills. Occurs from western Iowa to eastern Washington and New Mexico and Utah.

Fescue Grass (Festuca pratensis). Naturalized at low altitudes. A—Spikelet. (Lamson-Scribner, U. S. Dept. of Agr.)

Buffalo grass (*Buchloe dactyloides*). Another grass of the open. Occurs as far south as New Mexico, but rarer in this state than in Colorado.

Wild Timothy (*Beckmannia erucaeformis*). A sub-equatic in the Rocky Mountains and the Uintah mountatins, up to an altitude of 6,000 feet, and at lower altitudes in the north.

Red top (*Agrostis alba*). An introduced grass; common in low meadows of the Rockies, especially where irrigation is practiced.

Timothy (*Phleum pratense*). Occurs everywhere in the Rockies. The most widely distributed of the introduced grasses. At lower altitudes in meadows, and at higher altitudes frequently along roadsides and trails.

Mountain Timothy (*Phleum alpinum*). In mountain meadows. Subalpine throughout the Rocky Mountains.

Bunch grasses:

(*Stipa viridula*). Common at lower altitudes in open woods and parks.

(*Stipa columbiana*). Common in the mountains and open parks.

(*Stipa comata*). A grass of the plains and foothills.

California oats grass (*Danthonia californica*). In open parks at altitudes of from 7,000 to 9,000 feet. Is common from Colorado to Montana and westward.

Oat grass (*Trisetum subspicatum*). Common on mountain slopes throughout the Rocky Mountains.

Hair grass (*Deschampsia caespitosa*). Is frequent in the moist meadows at 6,000 feet in Utah. Generally 7,000 to 9,000 feet. Everywhere in the Rockies and across the continent.

Squirrel tail grass or wild barley (*Hordeum jubatum*). Common in alkaline soils, meadows and marshes, and on the borders of irrigation ditches throughout the Rocky Mountain region.

Wild barley (*Hordeum nodosum*). Common also in saline meadows at higher altitudes.

Melic grass (*Melica bulbosa*) and (*M. spectabilis*). Are common in the mountains of especially Colorado, Utah and Wyoming, usually occurring in the thickets or in open parks.

Koeleria (*Koeleria cristata*). Common in dry soils and parks in the Rocky Mountains and eastward across the continent, generally at low altitudes.

Drop seed grasses (*Sporobolus*). There are several common species, usually of the bench lands. Most of the species are invaders from the south, southeast or east.

Vanilla grass (*Hierichloe odorata*). A sweet-scented grass, common in meadows of the Rocky Mountain country and extending eastward across the country.

Mesquite or Grama Grass (Bouteloua oligostachya). A—Empty glumes; B—Spikelets with hairy rachilla. Common, eastern Rockies and plains. (U. S. Dept. of Agr.)

Buffalo Grass (Buchloe dactyloides). A—Female plant (pistillate); B—Male (staminate); A1—Pistillate spikelet; B1—Staminate spikelet. (U. S. Dept. Agr.)

Blue Joint or Reed Grass (Calamagrotis inexpansa). A—Glumes; B—Lemma, hairs and palea. In marshes, bogs, of Wyoming and eastward. (U. S. Dept. Agr.)

Macoun's Reed Bent (Calamagrostis macouniana). A—Glumes; B—Floret with lemma, plumose prolongation of rachilla; C—Rachilla with hairs. Iowa to Rocky Mountains and Washington. (U. S. Dept. Agr.)

Koeleria (Koeleria cristata). A—Spikelet; B—Spikelet expanded, showing glumes, lemma, palea, stamens, and pistils. Common in foothills of the Rocky Mountains. (U. S. Dept. Agr.)

Indian Millet (Eriocoma cuspidata.) A—Spikelet; B—Lemma. Common in the eastern Rockies and Utah. (U. S. Dept. Agr.)

The Manufacture of Walnut Gun Stocks in Iowa

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Few people know that an Iowa company is the largest producer of rough gun stocks in the world. The Des Moines Saw Mill Company, located at the capitol city of the State, produces annually about 1,200,000 walnut gun stocks. This number has been sold by the company during the past year. It has been variously estimated that this number equals from 50 to 75 per cent of the total yearly supply of walnut stocks in the United States. With the exception of a few manufacturers of fire arms, the Des Moines Saw Mill Company supplies all of the leading gun companies of the United States using walnut stocks. Although a large part of the blank gun stocks are further manufactured in this country, some stocks are marketed in Europe.

Although the present company has been operating only four years, Des Moines has had a walnut saw mill for the past twenty years. During this period the mill has been operated by a number of different companies. It was at the time of the Spanish-American war that the firm began to concentrate its operations on the manufacture of gun stocks. This was brought about largely through the Government's placing an order for a million blank gun stocks with the company at that time. At the present time the Des Moines Saw Mill is the only company in the United States which specializes in the manufacture of this product.

During the present year the company's cut will be one and one-half million feet, board measure. One million feet of walnut logs are now piled at the mill awaiting manufacture. This amount will supply the mill for a period of about eight months, even though the company were not adding carloads of logs daily. It is probable that only on very few occasions has this quantity of black walnut logs been assembled in one place.

Iowa grown walnut is considered as one of the best woods for gun stocks—even better than the same timber grown farther to

the south. This may possibly be accounted for because of the relatively slower growth of the tree in this region. The manufacturer considers the Iowa walnut superior to the European species used for gun stocks, in most points, except toughness—in which the European walnut excels. The color of the Iowa wood is a rich chocolate brown which is intensified by proper finishing. It has been found that the black walnut will stand much rough usage, which adds to its value for gun stocks. Because of the false impression of the superiority of European walnut, European manufactuers have imported walnut logs from the United States, re-named them, and sold the product as the European wood.

As indicated on the accompanying map, the greater part of the company's supply of logs is obtained from southern Iowa, northern Missouri, southeastern Nebraska, eastern Kansas, and small amounts from east of the Mississippi River. In a number of instances the logs are bought through jobbers who receive a percentage commission. Frequently, however, the company purchases directly from the owner of the timber. In this case a man is sent to inspect the logs, which must be piled on a suitable siding on the railroad. The purchases are made generally from farmers who are clearing land. The logs must measure twelve inches or over in diameter at the small end, but may be of any length. The logs need not be clear. The trees as a rule have a relatively short clear-length and, as a result, the proportion of knotty logs is somewhat high.

The company does not specify a price for logs until they are seen because of the great variation in size and quality. As a rule the prices range from $25 to $125 per thousand board feet. In exceptional cases this price might be below this or in the case of very high class logs a price exceeding $125 per thousand feet is occasionally paid.

Although a large part of the walnut timber in the central region has been cut, there are considerable amounts to be found on the moist lands adjoining the streams and more especially in northern Missouri. The company estimates that they will have no shortage on walnut timber for many years unless the walnut wood is used more extensively for other purposes than at present.

No attempt is made by the company to purchase logs outside of the area shown on the map. This is due to the increased

Shaded area shows region from which most of the walnut logs are obtained for the Des Moines Saw Mill Company.

freight charges to Des Moines. The rate from Kansas City to Des Moines is 11 cents per hundred pounds. The rate for average points in northern Missouri is 9½ cents. For interstate shipments, the rate on the walnut logs is the same as the through lumber rates. For intra-state shipments the rate is the same as for soft coal. A large number of the purchases of logs are in the territory of the C. B. & Q. Railroad.

Altogether the freight rates on logs are quite satisfactory, except for some dissatisfaction found in the rates on the manufactured product which is shipped to the east. It is understood that the railroads have promised an early adjustment of this difficulty.

Practically all of the logs are shipped in open coal cars—which facilitates unloading at the mill. A steel derrick, with a bearing pole 100 feet in height, operated by steam and cable, is used for unloading. The logs are piled to a height of 60 or 70 feet.

Because of the greater ease in working freshly cut timber the logs are sawed as soon as they reach the mill, unless the receipts are in excess of the cut, which is the case at present.

Before sawing most of the logs are barked by axe, in order to protect the saw from grit. This is done on the rollway. The ordinary double circular saw is used, cutting from above as well as below when large logs are encountered. Before being gummed, the saws measure 54 inches and cut a kerf of about 3-16 of an inch. Since practically all of the boards are thick the loss in kerf is not excessive. The saw carriage is cable driven and the power for the saw and carriage is supplied by a 50-horse power motor.

The standard gun stocks are manufactured from blanks two inches in thickness. Foreign governments, with the exception of Japan, call for stock 2¼ inches thick and the United States Government uses stock 2⅜ to 2½ inches in thickness.

Cants are sawed, in thickness depending upon the orders being filled, which are carried forward on rolls and loaded on trucks operated on rails. The truck loads of cants are taken to the second floor by hydraulic elevator where the trucks are rolled to the pattern marker's benches. The markers outline in pencil around the thin wooden patterns. The marking must be done so as to obtain the proper run of grain in the stock and at the

same time the cuts must be made so as to utilize the material as fully as possible. The pattern markers mean the making or loosing of a considerable amount of money. It is generally possible to use a number of patterns of different shapes at the same time. This makes possible a closer utilization of material. At the present time the company is manufacturing blank gun stocks from about twenty-five different patterns. Most of the stocks are of the short type but some must be long enough to allow for the forearm or grip which is found beneath the barrel in some types of guns. In all cases the patterns allow ample material for proper trimming and dressing down for the finished product.

The marked cants are next conveyed to the band saws where the blank stocks are sawed out. Two of the three band saws on the upper floor of the mill are generally used for sawing out the blanks. The third saw is used for sawing other material. Each band saw is operated by two men—a sawyer and helper—and each saw has a capacity of about 200 blank stocks per hour. A set of gravity live rolls transports the blank stock to a chute which delivers the pieces to the kiln. A system of switches in the chute diverts the blocks to the particular kiln which is being filled.

Four steam kilns are kept in operation, each wtih a capacity of about one-half a car. The blank stocks are piled carefully, on edge, in the kiln, from the floor to the ceiling, with no particular attention paid to leaving spaces between the pieces. Steam is admitted to the kiln from small holes bored in pipes which are laid in the floor. A temperature of about 175 to 200 degrees F. is maintained continuously for 96 hours. A circulation of the steam is made possible by two vents—one in each end of the roof of the kiln. The kiln process has two distinct advantages. In the first place it reduces the freight charges by 20 per cent by reducing the weight. Another advantage is gained by the darkening of the sap streaks, in the cheaper grades of material, during the steaming process.

After the required time in the kiln the stocks are carried, or run on a gravity live roll, from the kiln. The unloading is accomplished from the opposite end of the kiln from which it was loaded. This lessens the distance for conveying the product.

The next step in the process consists in dipping both ends of

the gun stocks in warmed parafine to the depth of about one-half an inch. A small vat about two feet long is used and each piece is dipped separately. This, of course, is for the purpose of preventing checking. The dipper man places the parafined blocks on brackets which are attached to an endless chain, operating in a vertical position. This chain conveyer carries the stocks to the distributing tower where the product is inspected, sorted and distributed by chutes to the various bins where the material air seasons for a varying length of time. A buffer or padded "back stop", hinged at the upper end, is placed at the lower end of each chute to prevent the stocks from becoming unnecessarily jammed when they fall into the bins. The walls of the bins are constructed corn crib fashion in order to permit a good circulation of air. Shipments are generally made in car lots.

With certain brands a distinction is made between the ordinary stocks and selects or highly figured pieces. The wavy or curly grained sticks are use in high class firearms. Although more expensive, this selected stock is more difficult to finish because of the chipping up of the wavy or curly grain under the tool.

Throughout the mill there is a very close utilization of material. The slabs are cut into cants as they come from the saw and worked into pieces varying in size from 1½x1½x6 inches to 1½x1½x21 inches. The former or smaller pieces are eventually made into the forearms or slide arms for repeating rifles, and the latter into billiard cue handles. Several intermediate sizes of material are also cut from the slabs. For this work a band saw and small circular cut-off saw, located on the ground floor of the mill, are used, two men working at the former and one at the latter machine. The edgings, unusable slabs, ends and defective pieces are loaded directly into coal cars and sold to two of the local railroad companies. There is a good demand for this waste material from the railroads. It is used for starting fires in the locomotives. The sawdust finds a ready market as a packing for ice. Because of the greater durability of walnut sawdust, it is considered superior to some of the other species for this purpose.

The mill also cuts some walnut pieces to be used for steering wheels of automobiles. These sticks measure 1¾x1¾x60 or 65½ inches. Only the very best grade of material can be used for this purpose. The wood must be very straight grained and almost

absolutely free from defects in order to make possible the bending of the sticks into a circular shape.

Only a very small amount of the walnut is sawed into lumber, and this is only to accommodate small purchasers. Occasionally some of the walnut timber is shipped in log form to Europe, principally to Hamburg, Rotterdam, and Amsterdam. This is generally high class material which is nicely figured.

Although the company deals almost exclusively in walnut, it cuts annually on an average of about 125 thousand feet of other hardwood species. Oak logs are purchased for from $15 to $23 per thousand feet net to the seller, and cottonwood nets the original owner of the logs $12 to $15. Other species which are cut to some extent are elm, ash, hackberry, basswood, soft maple and hickory. All of these except basswood, soft maple and cottonwood are cut into special dimension material for use in the city. The basswood, soft maple and cottonwood are mostly cut into 1 inch material and used for cabinet backs, shelving, etc. The average selling price for the lumber, other than walnut, is $40 per thousand board feet.

The mill operates 300 days in the year and 9 hours per day. Although the maximum capacity of the mill is small—about 10,000 feet board measure per day—the utilization is close and the products require handling a number of times, consequently a comparatively large mill crew is required. Thirty-five men make up a full crew and they are apportioned as follows:

Two Superintendents.
Three men with the unloading derrick.
Six men at the circular saw.
Eight men at the small band saws.
Two men at circular cut-off saws.
Five pattern markers.
Four kiln men.
Two saw filers.
Three roustabouts.

The wages paid run from $1.50 per day up. About 25 per cent of the labor is negro.

Each saw and machine is operated by a separate motor which adds materially to the efficiency of the plant. The electric power is purchased from the city.

Under ordinary conditions, about 90 days elapse between the

A walnut log after barking, ready to be rolled onto the saw carriage.

A pile of 1,000,000 feet of black walnut logs in the yards of the Des Moines Saw Mill Company

Unloading derrick at the plant of the Des Moines Saw Mill Company.

The sorting tower where stocks are inspected and distributed by chutes to the storage bins.

time the logs are purchased and the time the product is marketed. Occasionally requests are received for gun stocks which have been air seasoned for a greater or less period after cutting. In some cases the period specified is five years, but the company does not receive such orders inasmuch as the price of the product would be greatly increased, due to the interest on invested money and insurance on the stock itself.

The operation of the Des Moines Saw Mill Company is unique in that the mill occurs in a region where little timber is being cut, and also because of the class and quantity of the product which they produce.

A Summer Camp Course For Ames Foresters

The forester's camp has come to be a regular feature in connection with the forestry courses of a number of educational institutions. Class room instruction must be supplemented with field practice, and this can best be given in connection with a "camp" where the students are located on or near the timber where the practical work is to be done.

The camp course which makes up a portion of the forestry schedule at the Iowa State College, comprises three months' work. The course is required of all students graduating in forestry and comes regularly in the vacation period between the second and third years' work. When the student in forestry has completed his second year at Ames, he has had some good foundation work and also courses in general forestry, silviculture, lumbering, minor forest products, history of forestry, forest mensuration, and forest nursery and planting. In short, he has had efficient preparation in both technical and general educational subjects to enable him to carry on the camp work efficiently.

The first course in the summer schedule, silviculture, has been preceded by general botany, ecology, dendrology and a preliminary class room course in silviculture. The camp course in silviculture is largely field work. The trees will be studied in view of their relation to each other and to their environment. Forest types will be considered as well as silvicultural methods of handling them.

The practical work in forest mensuration, the second of the summer courses, will consist largely in estimating timber, mapping, and in constructing volume and yield tables. The students will be given work which will acquaint them with the use of the various forest instruments, and which will be taken up in connection with the logging operations.

The third camp subject, lumbering, will consist of a detailed study of a large logging and milling operation. In this course the work will be followed from the time the trees are cut in the woods until the finished product is shipped. The camp will be

located so as to be easily accessible to logging and milling operations, and special emphasis will be put on the location and construction of logging roads for both steam and animal hauling. The students will present a report covering the field work in the course in lumbering.

The last course included under the summer camp schedule is "minor industries". In this course it is planned to study first hand, so far as opportunity permits, the manufacture of paper from wood pulp; the destructive distillation of woods; the manufacture of cooperage stock, veneer, excelsior, wagon and buggy stock, boxes, etc.

The camp work will not be limited absolutely to the above courses, but every opportunity will be taken to arrange for additional work by specialists in various phases of forestry, especially in connection with the administration and management of federal or state forest lands.

The camp will be movable, in order that a different location may be selected from year to year if desirable.

The Forestry Department furnishes tents, cots, chairs and the other necessary camp equipment and the students will furnish their own bedding and personal effects. A small fee is charged to the students to cover up-keep on the equipment that the college furnishes. Proper facilities are provided for reading and lecture purposes.

The students will provide for board on a cooperative basis. The cost per week, including cook and helpers, should not exceed $3.50. Other necessary camp expenses will be very light and the entire cost for the three months' camp should not exceed $90.

The lectures and field studies will occupy five and one-half days of the week, Saturday afternoon and Sunday being at the disposal of the students for recreation, special trips, or for other purposes. The outdoor life and numerous field trips take away largely the class room atmosphere, and the camp will prove to be a vacation as well as a profitable summer to the students.

After the summer camp course is completed, two additional years at Ames complete the required work for the Degree of Bachelor of Science in Forestry, and three years for the Degree of Master of Forestry. The work for the Master's Degree includes research investigations along one of these four lines:

Forest Management, Forest Products, Lumbering and Forest Protection.

The equipment of the Forestry Department at Ames is the best. The class rooms, laboratories, museum, seminar room, library and offices are located in the new agricultural building. A forest tract adjoining the campus and belonging to the Department furnishes ample space for demonstration and practice purposes. The campus, arboretum and native woods afford about 150 different species of trees for study. The Department maintains a forest nursery where the students get practice in making seed beds, transplanting trees and forming plantations.

The Department is equipped with one of the best collections of woods in the country. This includes about 1,500 specimens from the United States, Argentine Republic, Nicaragua, Japan and the Philippine Islands. The collection is of great value in the course on wood study.

It is the purpose of the Forestry Department of the Iowa State College to give the student the best possible foundation for professional work in forestry, not forgetting the fact, however, that, in addition to this, he must be equipped with a good solid general education in order to prove of greatest efficiency in his professional work.

During the past ten years there has been a steadily increasing demand for men with a training in forestry. The Government, in the past, has been the principal employer of graduates from the forest schools, but many foresters have been demanded by State Departments, lumber companies and railroads, especially in the last few years. The demand for foresters should increase as the diversified industries, related in one way or another to forestry, open up new fields of investigation and employment for technical men.

Because of the close relation which forestry holds with a number of the industries, the work of the forester may be greatly diversified. He may take up lines of investigation with a manufacturer using the products of the forest; he may be called upon to do scientific work in connection with an experiment station; he may turn towards teaching; or he may take up administrative or technical duties in connection with federal or state forests.

The beginning forester is generally so situated that a large

Where class room instruction is supplemented by field practice in the native timber lands.

portion of his time is spent out of doors for the first few years. Later, as a rule, his duties carry him both to the office and field. The profession is inspiring to the man who "takes to the work", and the field offers good opportunities to the prospective forester.

EDITORIAL STAFF

Advisors

This marks the publication of the second number of the "Ames Forester". The editorial staff and the Forestry Club of the Iowa State College express their appreciation of the support given in this work by alumni and friends of the department both financially and otherwise. As yet the publication is in its infancy, but, with the rapid growth of the Forestery department at Iowa State, and with the showing that is being made by our alumni, there is no reason why the "Ames Forester" should not make a correspondingly substantial growth.

Anything by way of suggestion or criticism that may help to make the publication a better one in the future will be gladly accepted by the staff.

ALUMNI DIRECTORY

An earnest attempt has been made to publish the following list as near complete and correct as possible. There are, in all probability, a few mistakes and some omissions, and the staff will greatly appreciate any notice of them.

R. F. Balthis: Forest Supervisor, Cloudcroft, New Mexico.

C. A. Kupfer: Forest Examiner, San Francisco, Cal.

E. A. Sherman:* District Forester, Ogden, Utah.

C. A .Scott: State Forester, Manhatten, Kansas.

W. G. Baxter:* Forest Examiner, Sopris National Forest, Aspen, Colo.

Henry Haefner: Siskiyou National Forest, Grants' Pass, Oregon.

Shirley Allen: Deputy Supervisor, Lassan National Forest, Red Bluff, California.

F. E. Ray: Des Moines, Iowa.

Robert L. Barrett: Superintendent Cooperative Orchard Co., Koshkoning, Missouri.

Frank G. Freeman: Santa Anna, California.

A. F. Hoffman: Forest Examiner, Pagosa Springs, Colorado.

W. C. Koepke: U. S. F. S., Springerville, Arizona.

Leland S. Parke: Chandler, Arizona.

L. A. Reynoldson: City Forester, Dubuque, Iowa.

P. T. Smith: U. S. F. S., Deadwood, South Dakota.

J. C. Whitham: Deputy Supervisor, Billings, Montana.

L. R. Lessel: U. S. F. S., Payson, Arizona.

A. C. O'Bannion: (Storm Lake, Iowa.)†

R. A. Olmstead: Raymond, Washington.

H. H. Richmond: U. S. F. S., Cass Lake, Minnesota.

W. A. Smith: District Office, Garden Valley, Idaho.

L. J. Baxter: (Galva, Iowa.)

R. Hensel: U. S. F. S., Wallowa, Oregon.

H. I. Ringheim: Dublane, Saskatchewan, Canada, via Macrorie.

E. H. Steffen: U. S. F. S., Wallowa, Oregon.

L. F. Watts: U. S. F. S., Evanston, Wyoming.

H. B. Clark: Blair, Nebraska.

L. J. Cronin:* (Sibley, Iowa.)
F. V. Horton:* Wallowa, Oregon.
H. H. Sage:* Sioux City, Iowa.
L. P. Wygle:* 715 E. 13th Str., Eugene, Oregon.
A. F. Miller:* Burlington, Iowa.
T. R. Truax: Forestery Department, Iowa State College, Ames, Iowa.
H. F. Wilcox:* Assistant Forest Ranger, Quincy, California.
C. E. Foresman: Neopit, Wisconsin.
C. H. Ineck:* Neopit, Wisconsin.

Class of 1914

R. W. Hayes
S. S. Van Boskirk
Wm. Nagle
W. C. Hassel
Ray Wolven
E. T. Wolfe
R. G. Schreck
J. C. Sterrett

† Addresses in parentheses may not be correct at present, but are addresses through which the men can be reached.

* Men who have not received the full degree in Forestry at Iowa State College.